REMARKS

Claims 1-3, 5, and 8-20 are pending in this application. Claim 1 has been amended to correct two typographical errors. This Response and claim amendment presents no new matter and raised no new issues. The applicants request reconsideration of the instant application in view of the preceding amendment and the following remarks.

The Claimed Invention

In brief, claims 1-3, 5, and 8-20 cover conductive resin composition, method for producing the same, and separator for a fuel cell. Along with urethane-modified epoxy (meth)acrylate (B), (meth)acrylate (C) is a key component to the claimed invention. The claimed invention employs urethane-modified epoxy (meth)acrylate (B) in order to meet the objectives of a conductive resin composition that exhibits a high level of mechanical strength, conductivity, gas permeability, corrosion resistance, and durability of the resulting molded article. However, urethane-modified epoxy (meth)acrylate (B) is highly viscous, therefore, the (meth)acrylate (C) component is an essential part of the claimed invention in that it acts as a diluent to improve handling properties in preparing the resin composition and to uniformly disperse other components such as conductive filler. That is, the (meth)acrylate (C) component helps achieve a conductive resin composition with improved capability to fill molds with complicated shapes. In this respect, the claimed invention achieves unexpected improvements by the specific combination of urethane-modified epoxy (meth)acrylate (B) and (meth)acrylate (C).

Claim Objections

In the Office Action, Claim 1 was objected to due to typographical errors.

Claim 1 has been amended to address this objection. Accordingly, the applicants

respectfully request reconsideration and withdrawal of this objection.

Claim Rejections – 35 U.S.C. §§102, 103

In the Office Action, claims 1-3, 8-9, and 11-20 were rejected under 35 U.S.C. §102(a) as anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over U.S. Patent Application Publication No. 2002/0055030 to Okumura, et al., evidenced by JP 61-009424 to Hideo, et al.

The applicants respectfully traverse this rejection.

First, Okumura does not disclose the (meth) acrylate (C) component of the claimed invention.

Claim 1 recites the following:

> the (meth)acrylate (C) is a reaction product obtained by reacting a **polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit** with a (meth)acrylic acid, or a reaction product obtained by reacting a polyisocyanate having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a **polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit** under the conditions that an isocyanate group of the polyisocyanate is in excess of a hydroxyl group of the ppolyol, with a (meth)acrylate having a hydroxyl group

It was asserted in the Office Action that the urethane (meth)acrylate disclosed in **Okumura** reads on the (meth)acrylate (C) of the instant invention. In particular, the following was asserted in the Office Action:

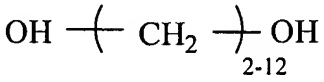
> The polyurethane oligomer includes a reaction product of diisocyanate and polyether diols such as polycarbonate diols (**aromatic polyether diols**).

(Office Action, Jan. 10, 2008, p. 3, ll. 16-17). However, **Okumura** does not use aromatic polyester diols to obtain (meth)acrylate:

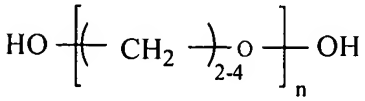
> A conventional polyurethane oligomer obtainable with the use of excess amount of diisocyanate component relative to diol component can be used as the polyurethane oligomer. **The polyurethane oligomer includes, for example, a reaction product of a diisocyanate component** (e.g., an aromatic diisocyanate . . . an araliphatic diisocyanate . . . an alicyclic diisocyanate) **with a diol component** (e.g., C_{2-12} alkylene glycols, polyether diols such as polyoxy C2-4 alkylene glycols, polyester diols, polycarbonate diols).

(Okumura [0048]). That is, **Okumura** uses aromatic diisocyanate or araliphatic diisocyanate to obtain a urethane oligomer. However, the diol which reacts with the aromatic diisocyanate or araliphatic diisocyanate is C_{2-12} alkylene glycols or polyether diols, such as polyoxy C_{2-4} alkylene glycols, polyester diols, or polycarbonate diols. These do not have an aromatic cyclic structural unit or an aliphatic cyclic structural unit. Instead, these compounds have the following chemical structure:

C_{2-12} alkylene glycol

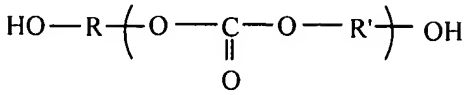


polyoxy C_{2-4} alkylene glycol



polyester diol

polycarbonate diol



Therefore, it is clear that **Okumura fails to disclose diol having an aromatic cyclic structural unit or an aliphatic cyclic structural unit**. Therefore, the urethane (meth)acrylate in **Okumura** is structurally different from the claimed (meth)acrylate (C). Moreover, **Hideo** fails to compensate for **Okumura**'s insufficient disclosure. Without any teaching or suggestion as to (meth)acrylate formed with polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit, as recited in claim 1, **Okumura** and **Hideo** in no way renders the claimed invention obvious.

Second, the combination of Okumura and Hideo fails to arrive at the claimed urethane-modified epoxy (meth)acrylate (B).

First, the reference in the Office Action to "mono(meth)acrylate" is incorrect as this should read "mono(meth)acrylic acid":

> Okumura et al disclose the vinyl ester-series resin (e.g., epoxy (meth)acrylate), which is methacryloyl as evidenced by Hideo et al (JP 61-009424) that the monoepoxide reacted with **mono(meth)acrylate** forms a unsaturated acrylic ester diols (Abstract).

(Office Action, Jan. 10, 2008, p. 4, ll. 4-6).

Second, the cited prior art provides absolutely no teaching or suggestion to use the vinyl ester resin of **Okumura** to form the claimed urethane-modified epoxy (meth)acrylate (B). It was first asserted in the Office Action of May 15, 2007, to combine **Okumura** with the teachings to **Hideo** to arrive at the claimed urethane-modified epoxy (meth)acrylate (B):

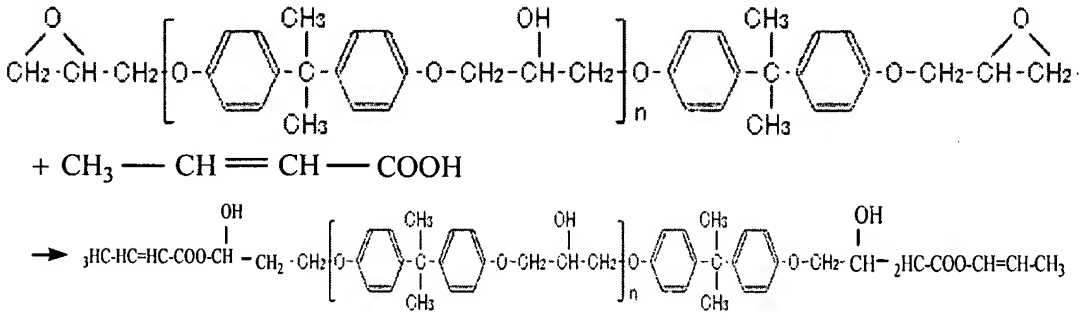
> Hideo et al (JP 61-009424) cites: urethane (meth)acrylate resin is obtained by reacting glycerin mono(meth)acrylate with organic diisocyanate, thus obtain isocyanate compound with hydroxyl-containing (meth)acrylate. The glycerin mono(meth)acrylate is obtained from glycidol (monoepoxide) and (meth)acrylic acid. (Abstract) **Therefore, the epoxy (meth)acrylate disclosed by Okumura as vinyl ester-series resin include (meth)acrylate diols capable to form the urethane (meth)acrylate resin by reacting with organo isocyanate.**

(Office Action, May 15, 2007, p. 6, ll. 5-12).

Even if it were true that **Okumura** discloses (1) vinyl ester resin to be a diol, which the applicants do not concede, the references fail to provide any teaching or suggestion to use (1) vinyl ester resin to obtain urethane (meth)acrylate resin. The vinyl ester resin of **Okumura** appears to be as follows:

The epoxy (meth)acrylate disclosed in **Okumura** is a reaction product obtained of a compound having one or more epoxy groups in a molecule with an ethylenically unsaturated

compound having a carboxyl group such as an unsaturated monobasic acid [0022]. As a preferable compound having one or more epoxy groups in a molecule, bisphenol A -type epoxy is exemplified [0031]. As a preferable ethylenically unsaturated compound having a carboxyl group, (meth)acrylic acid is exemplified [0034]. These are shown by the following reaction formula.



It should be noted that both of the hydroxyl groups in the vinyl ester resin (which was asserted to be a diol in the Office Action) are secondary hydroxl groups, as shown in the reaction formula above. Secondary hydroxyl groups have lower reactivity with isocyanate groups. The reactivity of the secondary hydroxyl group is about half of the reactivity of the primary hydroxyl group.

With respect to using the (1) vinyl ester resin of **Okumura** to obtain the claimed urethane-modified epoxy (meth)acrylate (B), the Office Action of May 15, 2007, incorrectly concluded the following:

> Okumura et al . . . also call this product as polyurethane oligomer in [0048]. Then, the urethane-modified epoxy(meth)acrylate as claimed by applicants is urethane (meth)acrylate in view of foregoing disclosure.

(Office Action, May 15, 2007, p. 6, ll. 12-14). That is, the assertion seems to be that:

- **Okumura** discloses that (3) **urethane (meth)acrylate** is obtained by reacting diisocyanate compound with diol.

- Therefore, when (1) vinyl ester resin is reacted with diisocyanate, urethane (meth)acrylate is obtained.

- Therefore, the urethane modified epoxy (meth)acrylate (B) of the present invention corresponds to the (3) urethane (meth)acrylate of **Okumura.**

According to the Office Action, **Okumura** uses the compound that is obtained as (1) vinyl ester resin in order to obtain (3) urethane (meth)acrylate. However, nowhere does **Okumura** disclose or even suggest that (1) vinyl ester is modified in order to obtain (3) urethane (meth)acrylate, that is, (1) vinyl ester is reacted with an isocyanate. In fact, **Okumura** completely fails to disclose or suggest using vinyl ester resin as diol.

A person of ordinary skill in the art would not have read the prior art and found the necessary teaching or suggestion to use the (1) vinyl ester resin of **Okumura** to arrive at the claimed urethane epoxy (meth)acrylate (B) of the claimed invention.

As for unexpected results, the claimed invention achieves the following objectives:

- Appearance of an molded article, that is, occurrence of separation between a resin component and a conductive filler, voids, and warp on molding are prevented;

- Flowability, that is, a resin composition is smoothly filled in a mold having a complicated shape; and,

- Ease molding, that is, difficulty in handling of a resin composition is improved.

In order to meet these objectives, in particular, the present invention has the following features:

Feature 1: the conductive compound contains a urethane-modified epoxy (meth)acrylate (B) obtained by reacting an epoxy (meth)acrylate (b-1) with a polyisocyanate (b-2), and having specific properties; and

Feature 2: the conductive compound contains a (meth)acrylate (C) which is a reaction product obtained by reacting a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a (meth)acrylic acid, or a reaction product obtained by reacting a polyisocyanate having an

aromatic cyclic structural unit and/or an aliphatic cyclic structural unit with a polyetherpolyol having an aromatic cyclic structural unit and/or an aliphatic cyclic structural unit under the specific conditions.

In order to improve heat resistance and mechanical strength of the molded article, the claimed invention has Feature 1. However, the urethane-modified epoxy (meth)acrylate (B) has high viscosity. Therefore, in order to compensate for the high viscosity of the urethane-modified epoxy (meth)acrylate (B), the claimed invention has Feature 2, that is, the conductive resin composition of the present invention contains (meth)acrylate (C).

In the claimed invention, the combination of Features 1 and 2 of the conductive resin composition exhibits unexpected improvements discussed below. In contrast, **Okumura,** which does not contain Features 1 and 2, cannot obtain the unexpected results of the claimed invention. This is clear from the comparison of the Examples and Comparative Examples in the Specification.

Examples 1 to 6 contained Features 1 and 2. It is clear from Table 3 ([0141], p.31) that Examples 1 to 6 are excellent in flowability in molding, appearance of the molded article, and flexural strength.

In contrast, Comparative Examples 1 to 3 did not have Features 1 and 2. Specifically, Comparative Examples 1 to 3 did not contain (meth)acrylate (C). It is clear from Table 4 ([0142], p.32) that Comparative Examples 1 to 3 had inferior appearance in terms of the molded article. Furthermore, it is clear from Table 3 that because Comparative Examples 1 to 3 did not contain (meth)acrylate (C), the molded article had inferior mechanical strength.

In addition, polyisocyanate (b-2) was not used in Comparative Example 4. That is, Comparative Example 4 did not have Feature 1. It is clear from Table 4 that Comparative Example

4 was inferior in handling. In addition, the appearance of the molded article was also inferior because the molded article in Comparative Example 4 had many voids.

Therefore, it is clear that the claimed invention having Features 1 and 2, which are not disclosed in the prior art, resulted in unexpected improvements.

In summary, **Okumura** and **Hideo** fail to render the instant invention obvious as the combined references do not arrive at the urethane-modified epoxy (meth)acrylate (B) or the (meth)acrylate (C) recited in claims 1-3, 8-9, and 11-20. Furthermore, the specific combination of claimed components, which are not disclosed in the cited prior art, resulted in unexpected improvements. Accordingly, the applicants respectfully request that the rejection of claims 1-3, 8-9, and 11-20 be reconsidered and withdrawn.

In the Office Action, Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over Okumura.

For the reasons discussed above, the applicants respectfully request that this rejection be reconsidered and withdrawn.

Claim 5 is rejected under 35 U.S.C. §103(a) as being unpatentable over Okumura, in view of U.S. Patent No. 5,888,608 to Numa, et al.

Numa discloses an aqueous coating composition to be used, for example, as base coating for automobiles or automobile repair. **Numa** was cited for the disclosure of "polyether diols such as alkylene oxide adduct of bisphenol A, polyethylene glycol, polypropylene glycol, and

the like." (**Numa**, col. 11, lns. 39-41). **Numa**'s objective was to produce a film with improved weather resistance, solvent resistance, adhesion to adjacent films, and surface appearance. On the contrary, **Okumura** is directed to a separator for solid polymer-type fuel cell produced by molding resin composition. Simply put, **Numa** fails to cure the insufficient disclosure of **Okumura** as explained above in reference to the first rejection.

For the reasons discussed above, the applicants respectfully request that this rejection be reconsidered and withdrawn.

CONCLUSION

The applicants respectfully submit that all of the claims now pending in the subject applications, namely, claims 1-3, 5, and 8-20 are directed to patentable subject matter. Accordingly, in view of the above amendment and remarks, the applicants believe the pending application is in condition for allowance.

Dated: May 12, 2008

Respectfully submitted,

By _____
James E. Armstrong, IV
Registration No.: 42,266
EDWARDS ANGELL PALMER & DODGE LLP
P.O. Box 55874
Boston, Massachusetts 02205
(202) 478-7375
Attorneys/Agents For Applicant